

**Title: Amusement Angles****Brief Overview:**

Students will be able to classify, identify, construct and define right, acute and obtuse angles. During this introductory unit students will identify and sort the different types of angles in real world pictures, objects, and shapes. This will eventually lead to the students becoming a builder of an amusement park ride or game that incorporates all the types of angles. Students will learn about how angles are useful in the real world when engineers are building things. Students should have prior knowledge of endpoints and rays.

**NCTM Content Standard/National Science Education Standard:**

Analyze characteristics and properties of two and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.

- Identify, compare, and analyze attributes of two- and three-dimensional shapes and develop vocabulary to describe the attributes

Use visualization, spatial reasoning, and geometric modeling to solve problems.

- Build and draw geometric objects.
- Create and describe mental images of objects, patterns, and paths.

**Grade/Level:**

Grade 3

**Duration/Length:**

Three class sessions, approximately 60 minutes per session.

**Student Outcomes:**

Students will:

- Identify right, acute, and obtuse angles in pictures and polygons.
- Classify and sort angles by definition and name.
- Be able to explain why angles are important and how they are used in real life.
- Construct a picture of an amusement park ride or game and label right, acute, and obtuse angles within the picture.

## Materials and Resources:

### Day 1

- 3 pieces of yarn per small group of students. The yarn should be long enough to make three circles and fit several small pictures inside of them.
- Plastic baggies
- Polygon cut outs (Student Resource 1, already cut and placed into bags.) One bag for each small group. Later in the lesson you will need enough to have one bag per student.
- Gumdrops (one large container per small group of children)
- Toothpicks
- Index cards
- The Three Angles story (Teacher Resource 1). A teacher copy is needed and one other copy can be turned into a poster or overhead transparency for students to follow along.
- Teacher Resources 2, 3, 4 and 5 one copy of each
- Food pictures (Student Resource 2). One for each student.
- Angle Family pictures (Student Resource 3)
- Amusement Angles exit ticket (Student Resource 4A, 4B, 4C). Each student will need one of each A, B and C.
- Glue
- Answer key for Student Resources 4A-4C (Teacher Resource 8A-8C)

### Day 2

- Paper
- Correct bridge picture (Teacher Resource 6)
- Changed bridge picture (Teacher Resource 7)
- Amusement Angles application worksheet (Student Resource 5) one for each student and one transparency
- Crayons, markers or highlighters in green, red, and blue for each student or group
- Amusement Angles assessment worksheet (Student Resource 6)
- Answer key for Amusement Angles assessment worksheet (Teacher Resource 9)
- Information about how angles are used in buildings and other structures can be found at the following website:
  - [http://www.mathamazement.com/Math\\_&\\_Application/Uses-of-Angles.html](http://www.mathamazement.com/Math_&_Application/Uses-of-Angles.html)

### Day 3

- Engagement worksheet (Student Resource 7). 2 per sheet, ½ sheet per student
- Coffee stirrers
- Gumdrops
- Polygon cut outs (Student Resource 1)
- Application worksheet Creating Your Own Amusement Ride or Game (Student Resource 8)
- Construction paper
- Summative assessment (Student Resource 9)
- Answer key for summative assessment (Teacher Resource 10A, 10B, 10C)

## Development/Procedures:

### Day 1

- Pre-assessment

Distribute three pieces of yarn and polygon cut outs (Student Resource 1) to small groups of students (3-4 students per group). Model how to make the yarn into three circles.

Explain that today we will be learning about different types of angles and that you want to see what they already know about angles. Instruct students that on each shape there is an area that has been highlighted. Use the yarn circles and the highlighted area to sort the polygons into the three groups. Students can choose how to group but need to be able to explain their reasoning.

To assess, observe and ask students to explain their reasoning on how they grouped their pictures.

- Engagement

Model how to make a triangle using three gumdrops as your corners and three toothpicks as your sides. Make sure that the students see you pushing the toothpicks into the gumdrops to hold the shape together.

Ask students what shape you have made and how they would describe it. Discuss as a class and list responses on the board.

- Ask: How many sides does this polygon have?
- How many corners?
- What is the name of this polygon?

- **Exploration**

Distribute four toothpicks and four gumdrops to each student. Tell students to make a polygon with four gum drops and four toothpicks. Once they have made their shape (a square) tell students to talk with a partner about what polygon they made and how they would describe it.

Discuss ideas as a class. Ask questions like:

- What is the name of the polygon that you made?
- “How many sides does this polygon have?”
- How many corners does it have?
- What might happen if I take a side away?
- What are some things that look like this polygon?”

Display a piece of paper or index card and model for students what a perfect square corner looks like by tracing your fingers over it. Ask students what they would need to do to their square to make something that looks like a perfect square corner. Have students work with a partner to change their squares into a perfect square corner.

Tell students to hold up what they have created.

Ask students if anyone knows what we call perfect square corners in math (right angles). Tell students that angles are measured in degrees and that a right angle measures exactly 90 degrees.

○ **Explanation**

Ask if anyone knows what a ray is. Draw one on the board and write the definition (a line that has one endpoint and goes on forever in one direction). This should be a review of prior knowledge.

Draw another ray on the board coming from the endpoint of the first ray to make an angle. Guide students to come up with a definition of an angle.

- How did the ray change?
- What do you think this might be called?
- Can you help me write a definition for the word angle? (two rays that share a common endpoint) Record the definition on the board.

Tell students that we have already talked about a right angle but there are other types of angles too. Explain that you will be reading them a story called “The Three Angles” and you want them to be looking for the difference between the angle characters while you are reading.

Distribute “The Three Angles” story (Teacher Resource 1). Read the story aloud while students follow along on their sheets.

- In the second sentence where the characters are introduced, say each angle’s name slowly and place a picture of each angle person on the board (Teacher Resources 2, 3, and 4).
- When the grilled cheese is mentioned in the story on the line, “So they settled on a cheesy, toasty, grilled cheese sandwich,” display a picture of the sandwich (Teacher Resource 5).
- Each time one of the angles tries to eat the sandwich, line up the bottom edges on the angles and place inside the angle person’s mouth. For example, when the story reads “Acute tried the sandwich first.”

After reading the story lead a discussion about the different types of angles, their names and how they are identified. First ask why the grilled cheese was the perfect fit in Right’s mouth. Show with the pictures again by placing the grilled cheese inside the mouth. This should lead students to come to the conclusion that the grilled cheese and Right’s mouth both make right angles. Ask students how they would describe a right angle. Write their answers on the board next to Right’s picture as the definition of a right angle. This should include a perfect square corner and 90 degrees.

Hold the grilled cheese up to Acute’s mouth again and ask why Acute was not able to eat the sandwich. The students should be able to tell you that Acute’s mouth is too small. Tell students that the angle made by this mouth is called an acute angle.

- Prompt students to think about the idea that if Acute's mouth is too small then how would you describe the angle Acute's mouth makes compared to the angle made by Right's mouth? Students should be able to tell you that it is smaller than a right angle. Write "less/smaller than a right angle" next to Acute's picture on the board.
- Draw some different examples of acute angles on the board under Acute's picture and ask students if they are all acute angles even though they look different (Use different degrees and orientations). Students should be able to tell you that they are all acute because they are all less than a right angle. A tip to help students remember that an acute angle is small is to tell them that an acute angle is "a cute little angle" and use a small voice when explaining.

Hold the grilled cheese up to Obtuse's mouth and ask why Obtuse was not able to eat the sandwich. The students should be able to tell you that his mouth is too big and the story said that the food had to be just the right size to fit each angle's mouth. Tell students that we call the angle made by this mouth an obtuse angle.

- Prompt students to think about "if Obtuse's mouth is too big, how would you describe an obtuse angle compared to a right angle?" Students should tell you that it is bigger or greater than a right angle. Write this definition on the board next to Obtuse's picture.
- Draw some different examples of obtuse angles on the board under Obtuse's picture and ask students if all of these are obtuse and why. As a challenge you could show an angle that is not obtuse to see if students can recognize and justify why the angles is not an obtuse angle.

#### ○ Application

Distribute food pictures (Student Resource 2). Tell students that now they are going to have a chance to compare the different types of angles by seeing what types of food have the same types of angles as our angle friends' mouths. Have students put the angle family pictures in a row on their desk (Student Resource 3). Tell students to sort the food pictures under the correct name and picture of each angle family member.

#### ○ Differentiation

##### ▪ Reteach

With a small group, distribute polygon cut outs (Student Resource 1). Show a right angle from the polygon cut outs and ask what it is called and why we call it that (it is a perfect square corner).

Show an acute angle and ask what makes it different from the right angle. Students should come to the conclusion that it is smaller. When they do, make three columns on a sheet of paper. For the heading in one column write, "acute angle-less than a right angle." In another column write, "right angle-a perfect square corner." Continue the same steps showing a picture of an obtuse angle. Write the name and definition in the other column.

Once the chart is made, have students sort the remainder of the pictures under the appropriate heading. This way, students will have the definition of each type of angle to refer to as well as an example of each while they are sorting.

- Enrich  
Have students make three columns on a piece of paper and label with acute, right, and obtuse. Challenge students to draw examples of each type of angle. This can include, flipping or turning the angle as well as showing different degrees even though they have not learned the actual measurements for those degrees.

- Assessment  
Distribute exit tickets to students (Student Resource 4A, 4B, 4C). Use polygon cut outs (Student Resource 1) from the pre-assessment to have students sort and glue. You will need enough for each student this time. Answer key can be found on Teacher Resource A-C.

## Day 2

- Engagement  
Explain to the students that they will be doing some math aerobics to get their brains ready for learning more about angles.

Ask: If I wanted to show an acute angle with my arms, how might I do that?  
Have a student come up and move your arms or tell you where to move your arms to show an acute angle. Ask the class to give an all student response by showing thumbs up if they agree or thumbs down if they disagree.

Tell students to stand quietly behind their chairs. Say: Now you show me an acute angle with your arms. Ask students to show you with their arms how their acute angle would change to become an obtuse angle and then a right angle.

- Exploration  
Tell the students that angles can be found everywhere and today they are going to go on an angle scavenger hunt around the classroom. Students should work in small groups of 3-5 depending on your class size. Distribute one piece of paper to each group. Explain that they are going to try to find as many examples of angles as they can in the classroom. They can walk around the room and should write down each type of angle they find and where it was found. Have several groups share a type of angle and show where they found it.
- Explanation  
Lead a discussion about real life angles. Ask students:
  - Where do you see angles in your own life outside of the classroom?
  - Who might use angles?
  - Ask if anyone knows what an engineer does. Explain that one type of engineer builds things.

Put a picture of a bridge (Teacher Resource 6) on the board or make a transparency and display it on the overhead. Ask students what angle is used between the base of the bridge and the poles that are holding it up (right angle). Ask students to give reasons why engineers used right angles in that portion of the bridge.

Show the bridge picture with the angles changed (Teacher Resource 7) and ask students: What would happen to the bridge if the angles were changed to look like this? Ask: What kind of angles replaced the right angles?

To wrap up the lesson and summarize the learning that took place ask students: Why do engineers choose to use the angles that they use? (Examples: a roof would not be pointed in the middle if the wrong type of angle was used, a ride may not be able to go downhill, a building could fall down because it doesn't have enough support with the type of angle it has)

- Application

Distribute Amusement Angles (Student Resource 5) Students will need a green, red, and blue crayons, colored pencils or highlighters. They will be finding and highlighting one of each type of angle within an amusement park ride.

Go over the directions together. Model on a transparency of Student Resource 5 or using a document camera how to trace the angle. A student could find an angle and then you could show them how to trace it.

When students have had a sufficient amount of time to work, use the transparency or document camera to check answers. Again, have a student trace the example of the angle. During this time, you can ask questions such as:

- How do you know it is that type of angle?
- How is your angle different from the angle the person before you traced?

- Differentiation

- Reteach

Cut out the food pictures (Student Resource 2) from day 1. Have students trace one angle on each picture and tell what type of angle it is. Talk about why it is that type of angle. To do this you draw a picture of a right angle on a transparency for them to be able to place the acute and obtuse angles over the top of the right angle to see if it is bigger or smaller. If you do not have transparencies you could use the corner of an index card to place inside the pictures.

- Enrich

Have students draw a picture and label as many angles as they can. The same crayons/highlighters from the application can be used to trace and label the angles.

- Assessment  
Students will again be finding and identifying the three types of angles within a different amusement park picture. Distribute Amusement Angles Exit Ticket (Student Resource 6). Go over directions together. Students will need the same crayons/highlighters they used in the application.

### Day 3

- Engagement  
Students will be given a sheet (Student Resource 7) with various obtuse angles on it and one right angle. Explain to students that they will need to circle the one angle that doesn't fit the rest and be able to explain what type of angle it is and why it doesn't fit into the group. Ask students to share their examples. An answer key can be found on Teacher Resource 9.

- Exploration  
Distribute coffee stirrers and gumdrops to each table. Model how to make a triangle with three coffee stirrers and three gumdrops (one side of your triangle should be longer than the other two). Hold your triangle so that the longest side is on the bottom.

Students should then make their own triangle to match yours. Ask students what kind of a ride this might represent. Lead them to come to the conclusion that it is a roller coaster.

Pose the question: I want to make my roller coaster have a steeper drop! How could I do that? Let students explore by adding stirrers and gumdrops or taking them away to change their triangle roller coaster. This activity can be done individually, with partners or in groups.

- Explanation  
Have students come up and share their new roller coasters. During the discussion ask questions like:
  - What type of angle did you use to make your roller coaster steeper?
  - Would you be able to use this roller coaster as the design for a real roller coaster? Why or why not?
  - What would happen to your roller coaster's drop if you used a right angle at the top of your triangle?
  - How does this relate to how engineers have to think in order to build things?
- Application  
Students will design a ride or game to put in the amusement park that the Angle family will visit next. The ride has to incorporate at least acute one obtuse and one right angle. The polygon cut outs (Student Resource 1) will also be used in the picture to identify angles within geometric shapes.



Distribute Creating Your Own Amusement Ride or Game (Student Resource 8) and construction paper. Read over directions together.

- Differentiation

- Reteach

In a small group tell students to make a square using toothpicks and gumdrops. Have them trace an angle with their fingers and tell what the angle is called. Have students make a triangle and trace one of the angles in the triangle. Ask students to identify the type of angle it represents.

Have students make a hexagon and trace one of the angles with their fingers. Tell students to identify the type of angle that they traced.

This will appeal to visual and tactile learners who may need to actually touch the angle to be able to understand.

- Enrich

In small groups have students use toothpicks and gumdrops to build a square. Ask them to name the type of angles a square has. Ask students to change the square to make a different shape that has an angle that is not a right angle.

Have students describe the angles that they made and make another shape with the third type of angle that they haven't used.

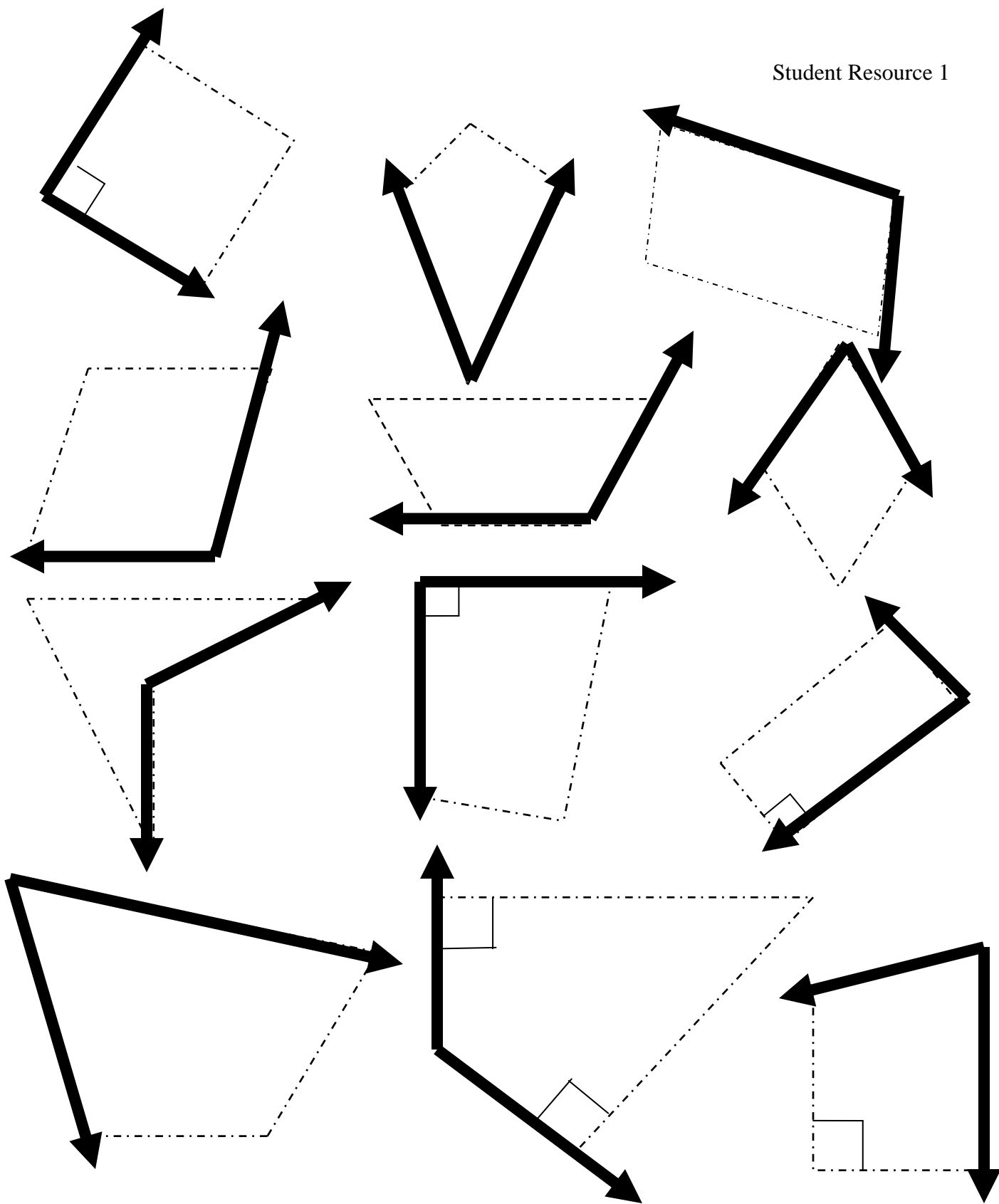
**Summative Assessment:**

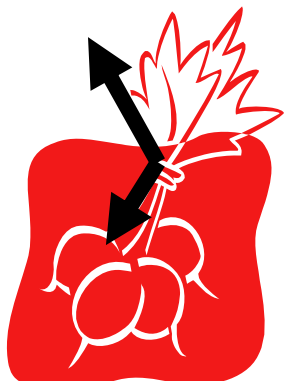
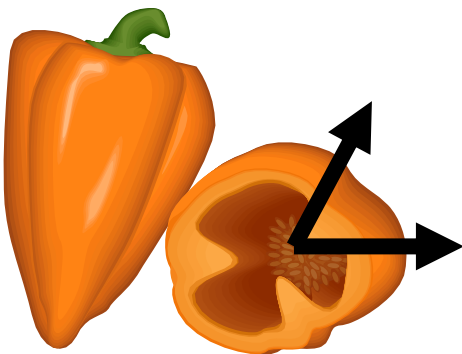
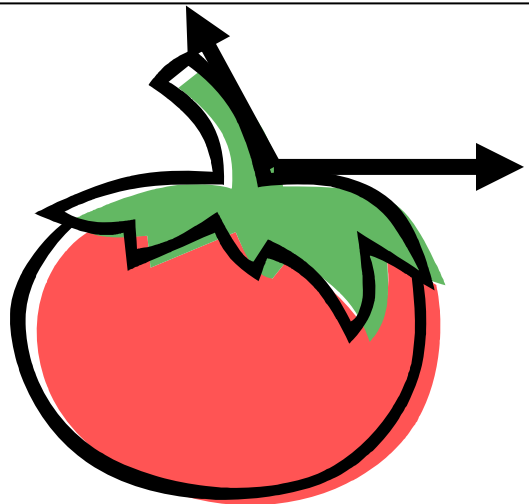
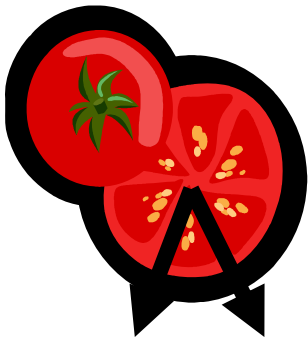
The summative assessment (Student Resource 9A, 9B, 9C) will require students to use what they have learned about acute, obtuse and right angles and how they are used in real life to answer questions about different rides and activities in an amusement park. There are several selected response questions and a constructed response that relates to the picture the students drew for the application section of the lesson in day three. Answer key can be found on Teacher Resource 10 A-C.

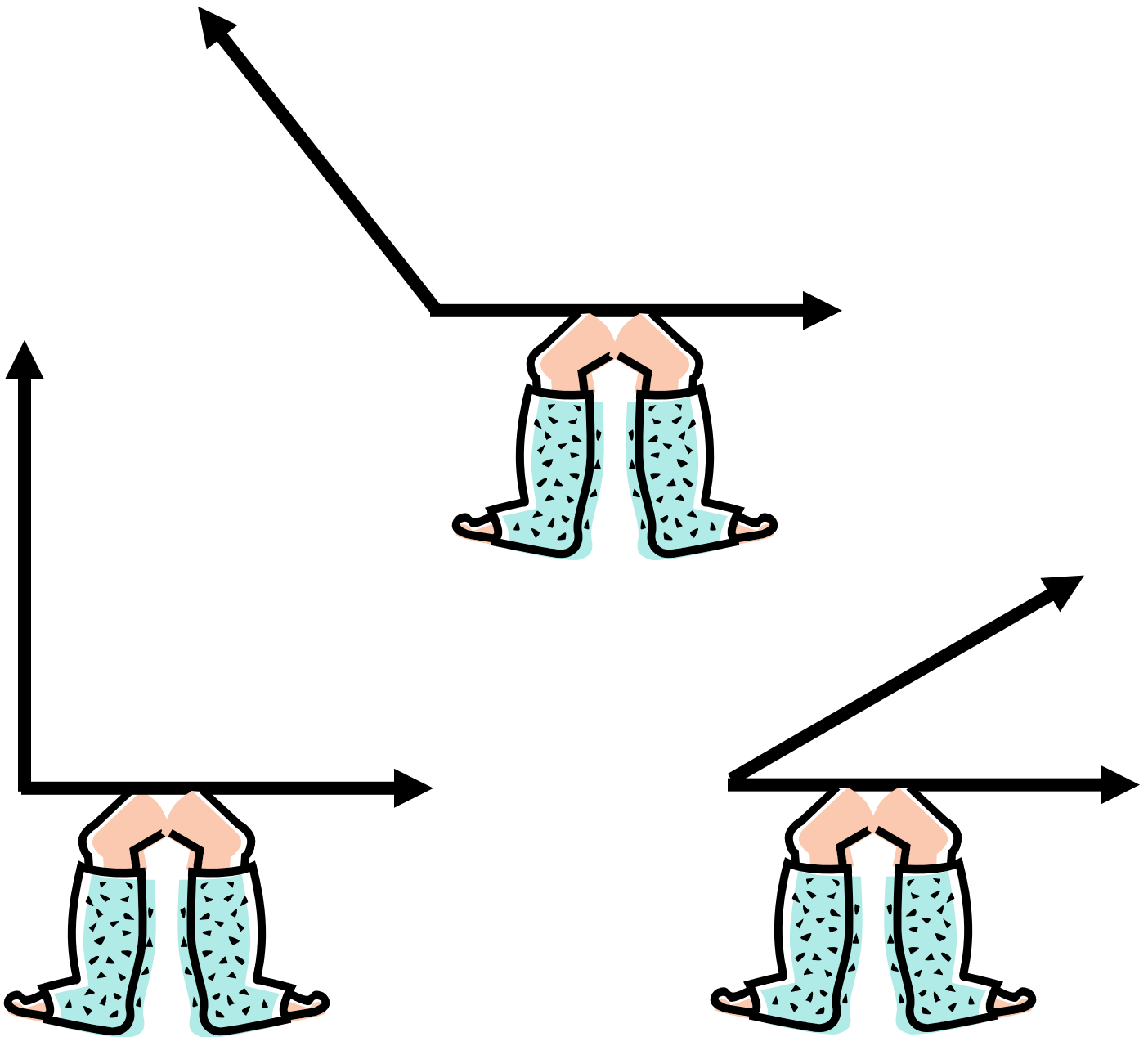
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## Amusement Angles

### Exit Ticket 1

Identify one angle in each shape. Glue all your acute angles in the circle below.

**Acute**



## Amusement Angles

Identify one angle in each shape. Glue all your right angles in the circle below.

**Right**



## Amusement Angles

Identify one angle in each shape. Glue all your obtuse angles in the circle below.

**Obtuse**

## Amusement Angles

Use the picture to find angles. Trace an acute angle in **green**. Trace a right angle in **red**. Trace an obtuse angle in **blue**.

**CHALLENGE QUESTION:** How many angles do you see in the picture?





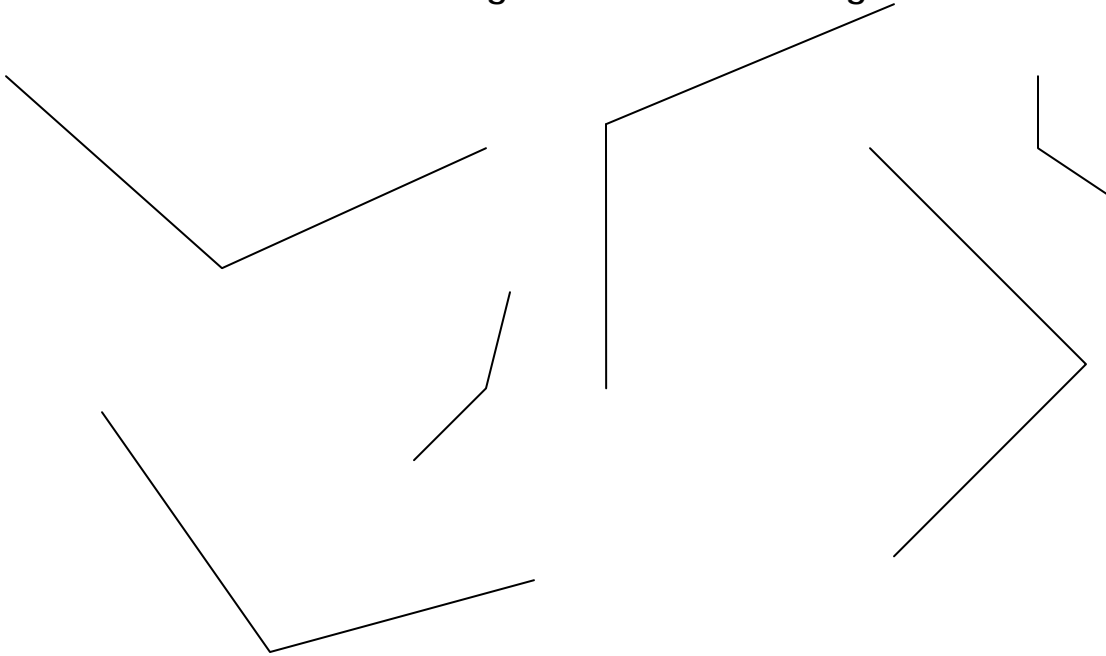
## Amusement Angles Exit Ticket

Use the picture to find angles. Trace an acute angle in **green**. Trace a right angle in **red**. Trace an obtuse angle in **blue**.

**CHALLENGE:** How many angles do you see in the picture?

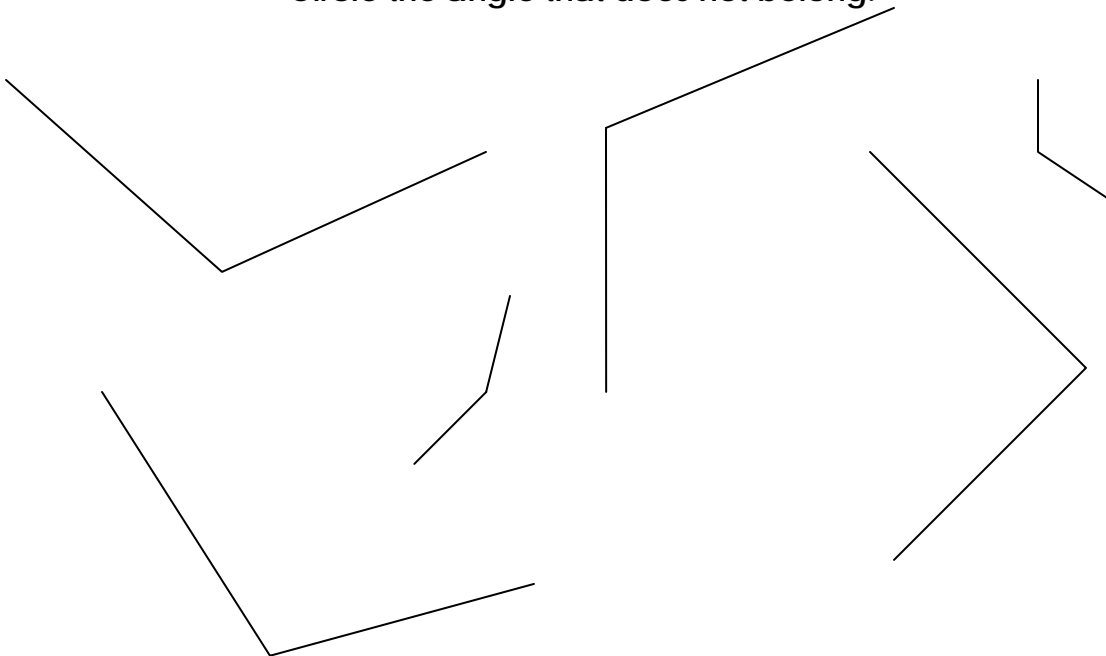


Circle the angle that does not belong.



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Circle the angle that does not belong.





## Creating Your Own Amusement Ride or Game

The angle family wants to try out a new amusement park. Use what you know about angles to design a new amusement park ride or game. Be sure to label the angles in your design. You may use the polygons on the resource sheet and draw the ride or game. Use the provided construction paper to create your design.

# Summative Assessment

Look at the amusement ride or game that you have created in our unit. Explain why one of your angles is important to your design. Be sure to include an example from your design in your response. You may use words and/or pictures in your explanation.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



## Summative Assessment

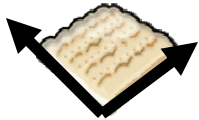
Use what you have learned about angles to choose the best answer to the following questions.

1. Bob wanted to build a roller coaster that had a steep drop. Which would he use?
  - a. line segment
  - b. square
  - c. obtuse angle
  - d. acute angle
  
2. Mary Jane is very afraid of very steep climbs. Which would you use to build her a roller coaster that she would enjoy.
  - a. acute angle
  - b. right angle
  - c. ray
  - d. obtuse angle

3. Tyler decided to cut his cheesy grilled cheese sandwich into four squares. What kind of angles will his sandwich now have?

- a. acute angles
- b. obtuse angles
- c. right angles
- d. no angles

4. Acute angle is looking for the best food to fit his tiny mouth. Which of the following should he choose?



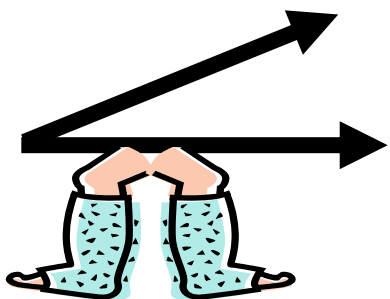
a. an ice cream cone



b. a square cracker

c. a chocolate chip cookie





## The Three Angles

Once upon a time three angle brothers went to an amusement park. Obtuse, Acute and Right spent their day riding roller coasters and playing games in the sun.

"Boy, am I hungry!" said Acute.

"Me too!" chorused the others.

So all three angles took a break from riding roller coasters in the sun and headed down to the snack shack.

" Boy! What choices!" said the angles.

Big brother Right said, " So many choices, but we must remember to select something that is not too small, and not too big to fit our odd angled mouths."

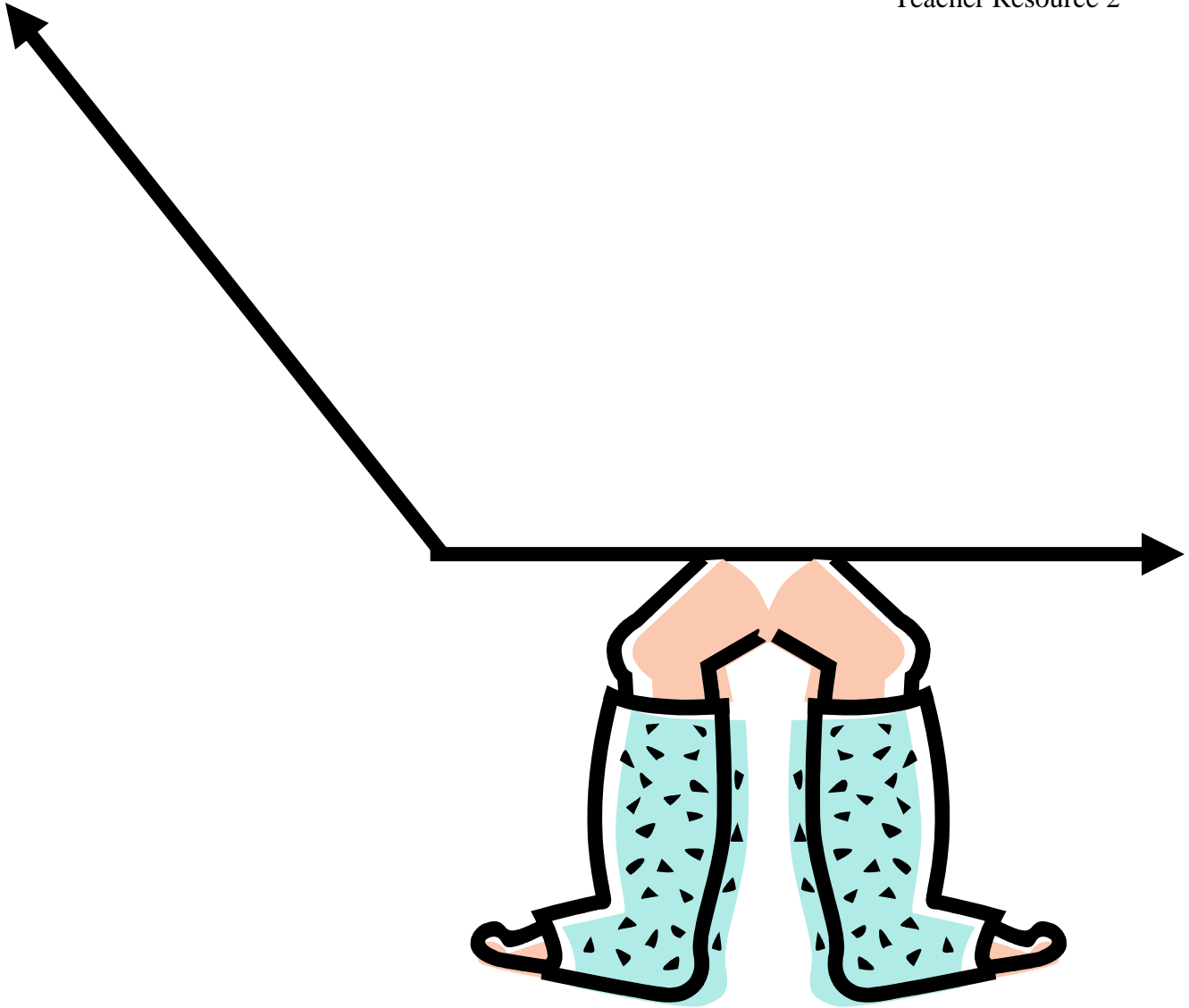
So they settled on a cheesy, toasty grilled cheese sandwich.

Acute tried the sandwich first.

"Oh no! This cheesy grilled cheese sandwich won't fit my mouth! I will have to order something else."

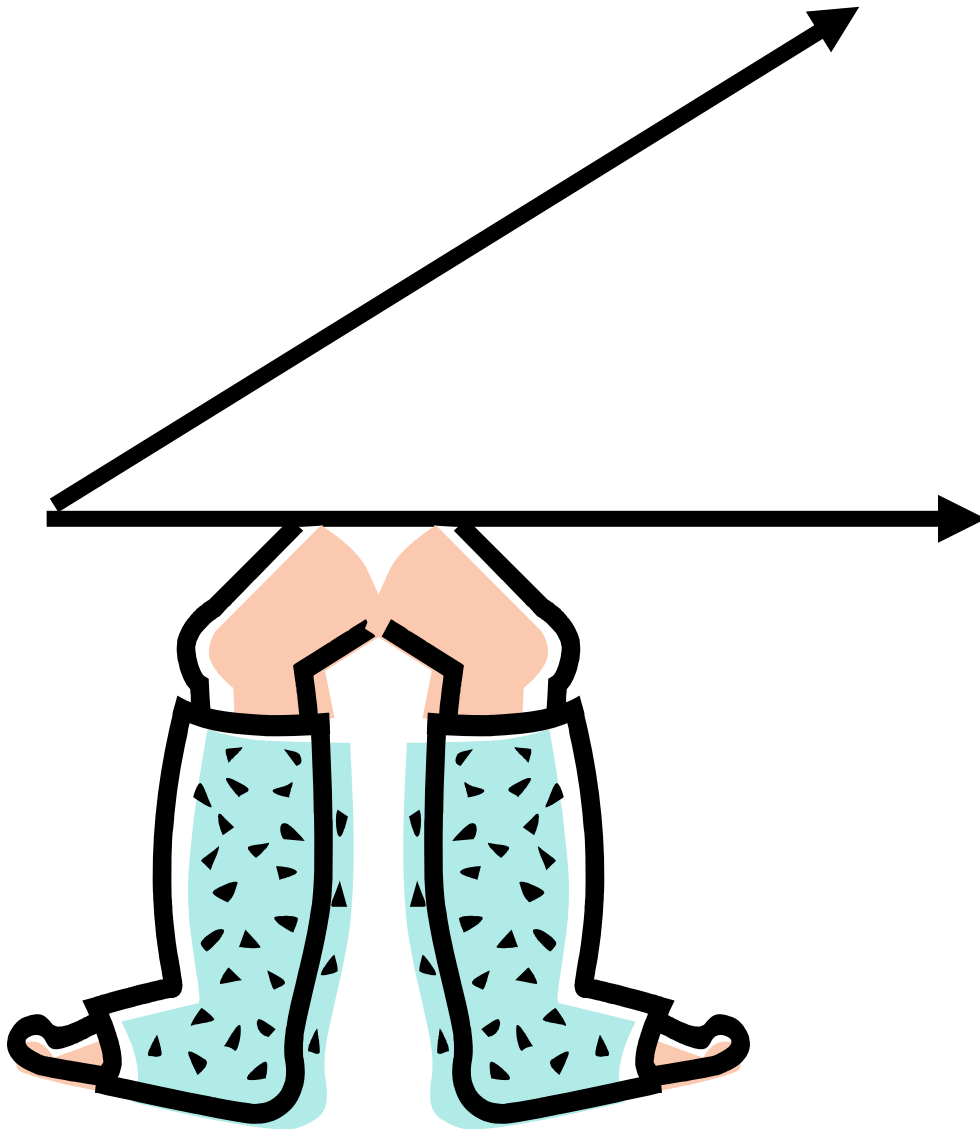
"Let me try," said Obtuse. He tried the sandwich. "It is much too small to fit my large sized mouth" he exclaimed, " I will have to order something else too! What a bummer!"

Now brother Right angle was always the smart one. Not wanting to waste food, Right tried the cheesy grilled cheese. It was the perfect fit.

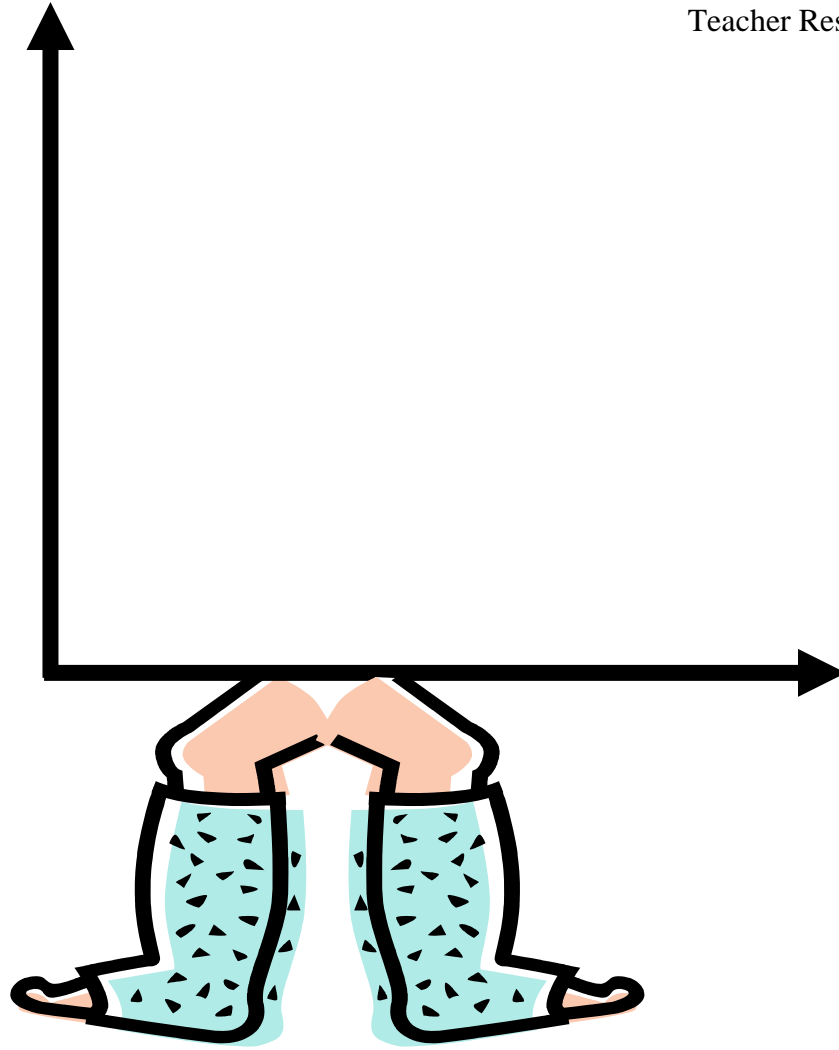


# Obtuse Angle



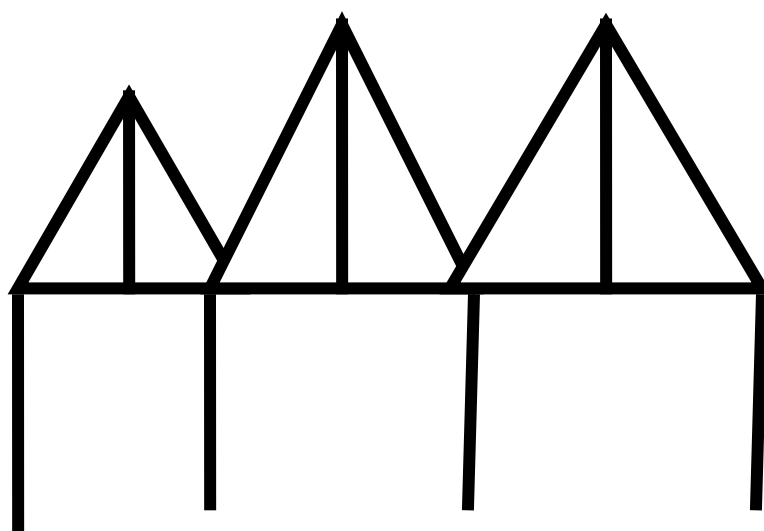


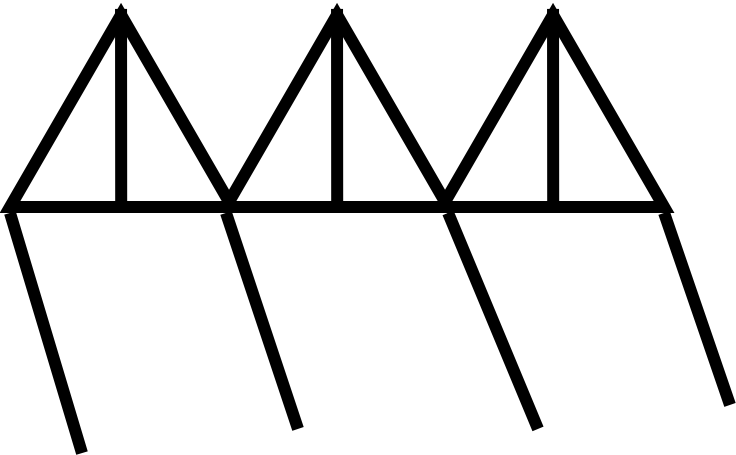
# Acute Angle



# Right Angle

# Grilled Cheese Sandwich

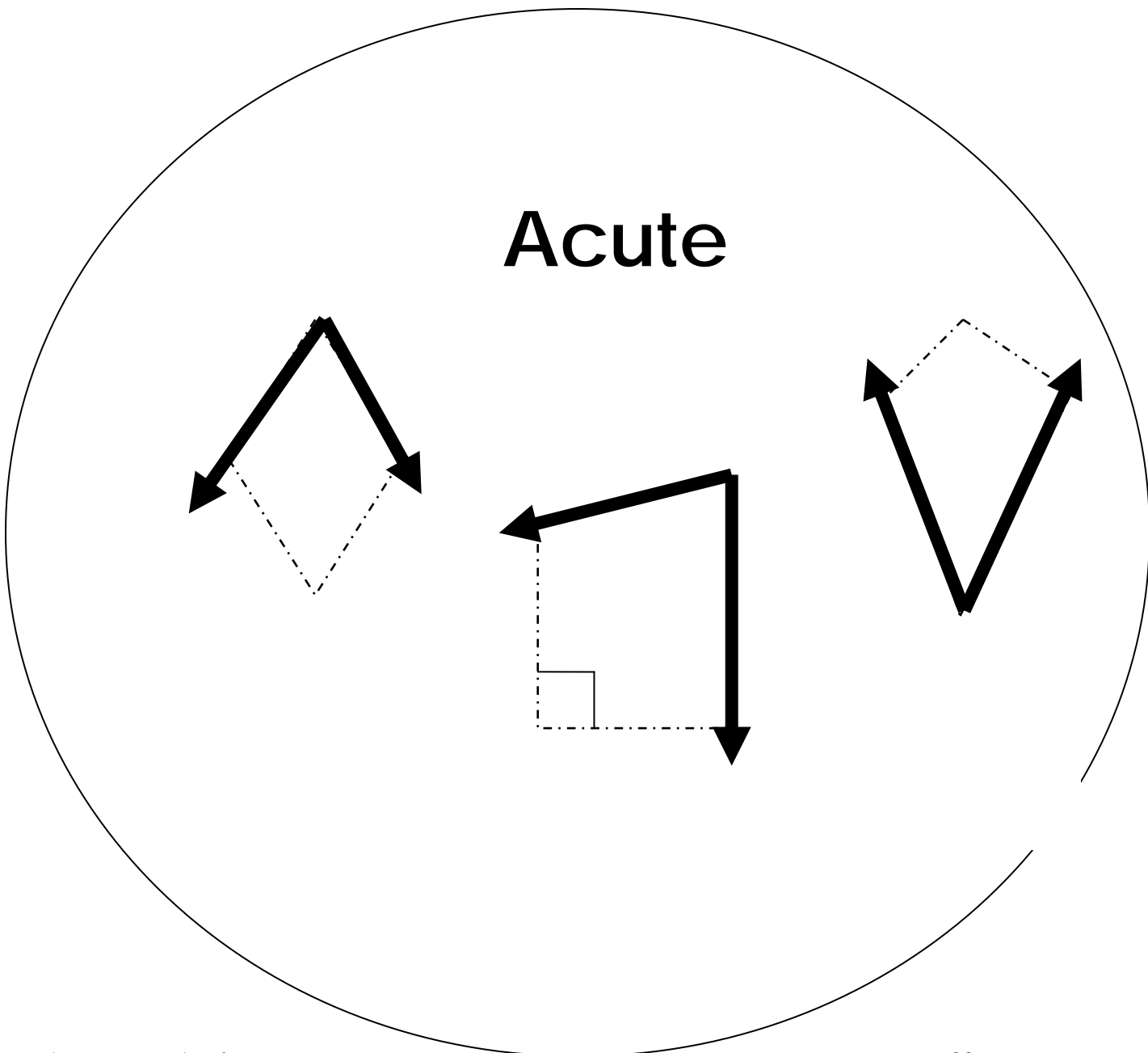






## Amusement Angles

Identify one angle in each shape. Glue all your acute angles in the circle below.

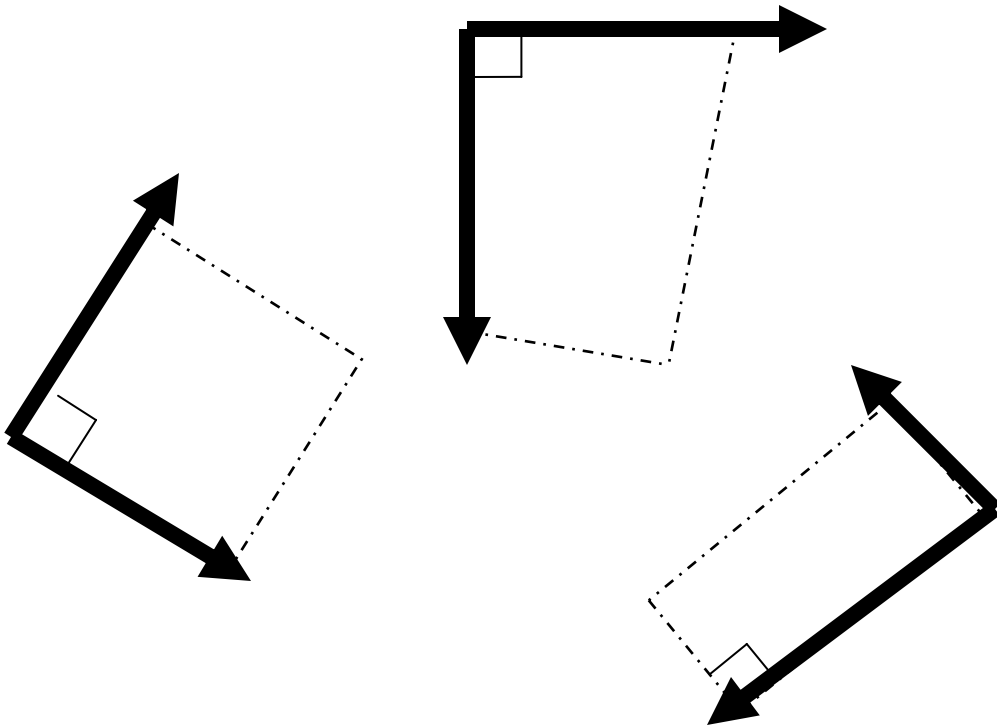




## Amusement Angles

Identify one angle in each shape. Glue all your right angles in the circle below.

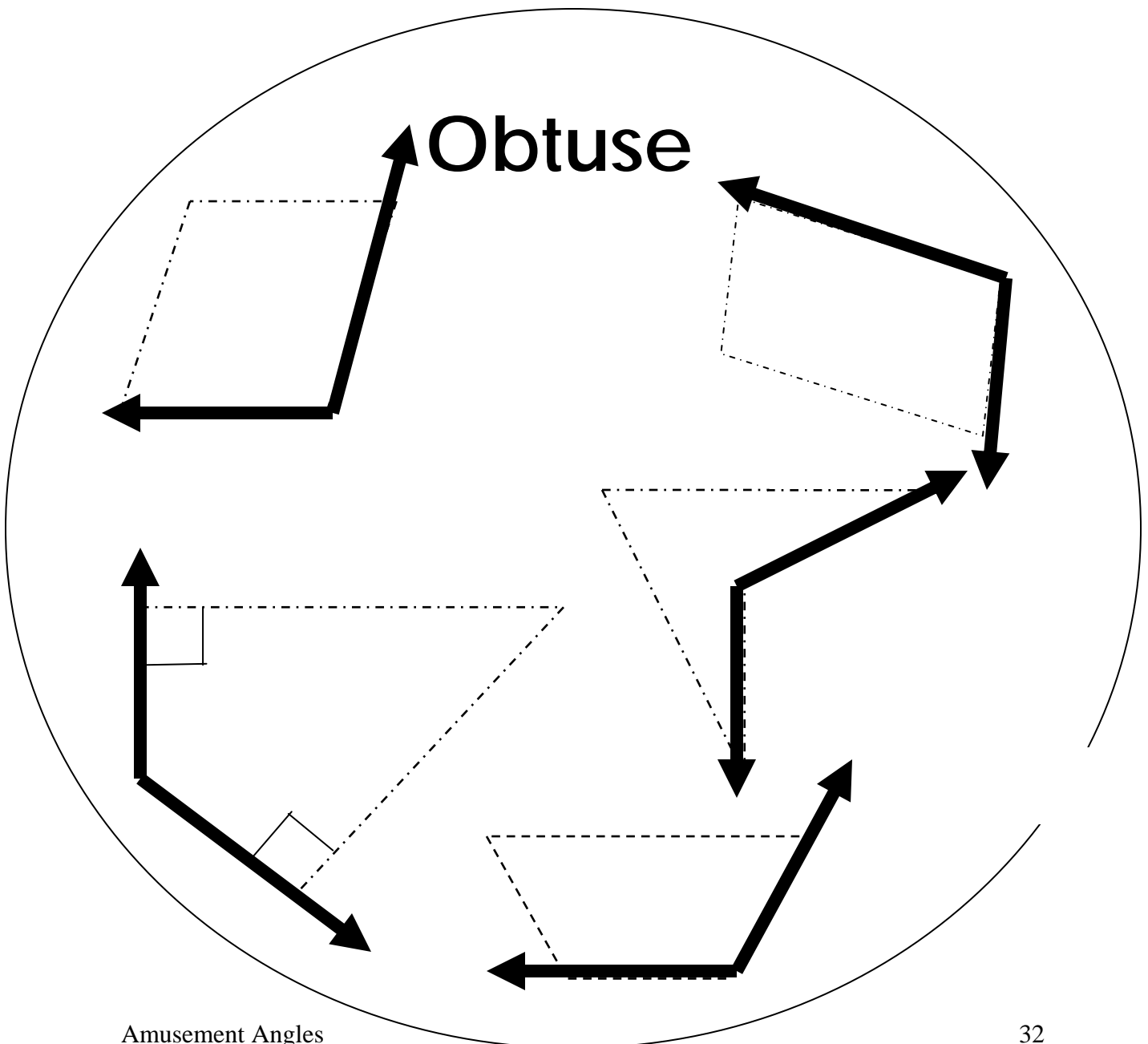
**Right**





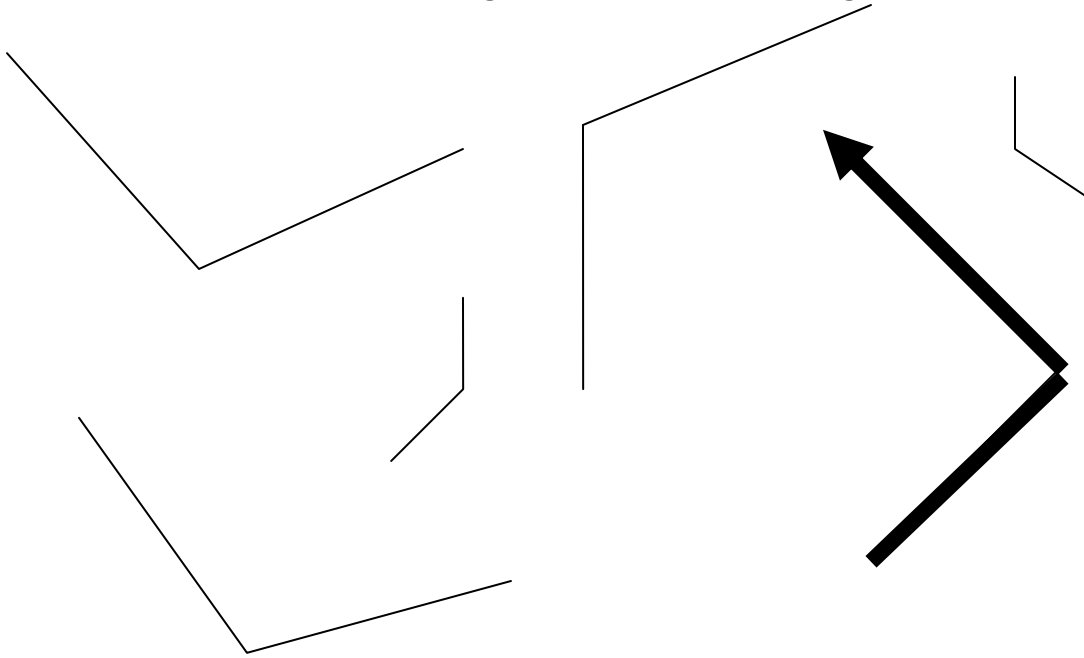
## Amusement Angles

Identify one angle in each shape. Glue all your obtuse angles in the circle below.



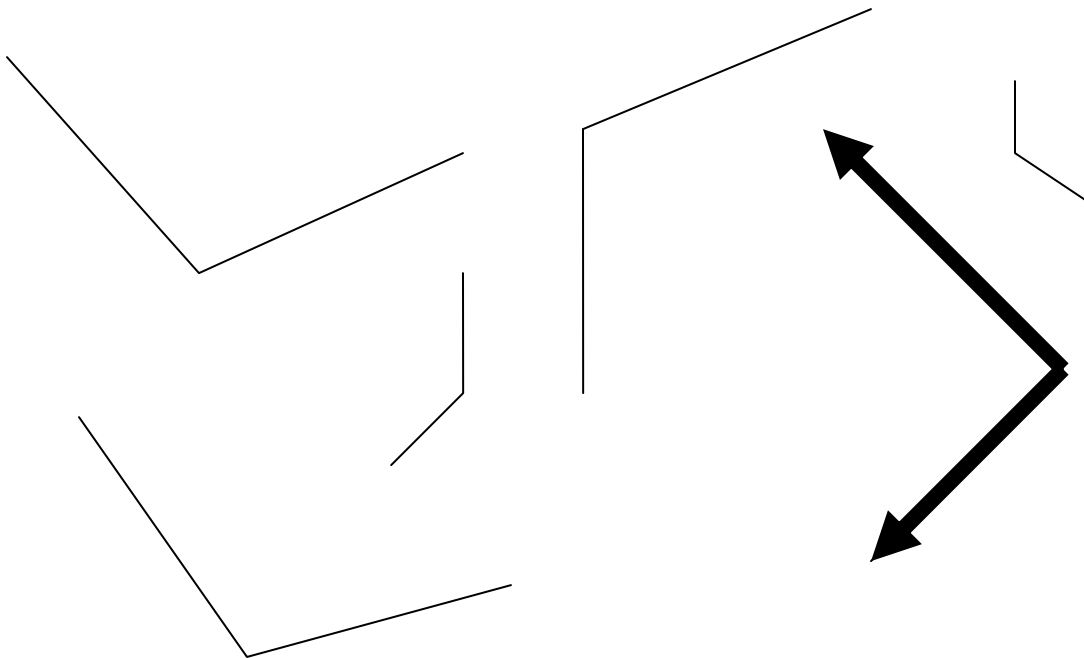


Circle the angle that does not belong.



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Circle the angle that does not belong.





Look at the amusement ride or game that you have created in our unit. Explain why one of your angles is important to your design. Be sure to include an example from your design in your response. You may use words and/or pictures in your explanation.

Answers will vary.



## Summative Assessment

Use what you have learned about angles to choose the best answer to the following questions.

1. Bob wanted to build a roller coaster that had a steep drop. Which would he use?
  - a. line segment
  - b. square
  - c. obtuse angle
  - d. acute angle**
  
5. Mary Jane is very afraid of very steep climbs. Which would you use to build her a roller coaster that she would enjoy.
  - a. acute angle
  - b. right angle
  - c. ray
  - d. obtuse angle**

6. Tyler decided to cut his cheesy grilled cheese sandwich into four squares. What kind of angles will his sandwich now have?
- a. acute angles
  - b. obtuse angles
  - c. right angles**
  - d. no angles
7. Acute angle is looking for the best food to fit his tiny mouth. Which of the following should he choose?
- a. an ice cream cone**
  - b. a square cracker
  - c. a chocolate chip cookie